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Myobiid Mites (Acarina, Myobiidae) Parasitic on Bats in Japan

III. Genus *Neomyobia* Radford, 1948

With 6 Text-figures

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ABSTRACT *Neomyobia aberrans* sp. nov. parasitic on *Rhinolophus ferrumequinum* and *N. plurihospitalis* sp. nov. occurring on *Rhinolophus cornutus* and *Rhinolophus* sp. are described. *Neomyobia aberrans* sp. nov. is distinctly different from *N. rollinati* (Poppe), a parasite of European *R. ferrumequinum*. This indicates that the Japanese and European *Rhinolophus* may belong to different taxa beyond the level of subspecies. *Neomyobia plurihospitalis* sp. nov. is very closely allied to *N. solvenica* Dusbábek, 1968, a parasite of *Rhinolophus euryale*.

Neomyobia mites are specific parasites of the bats of the family Rhinolophidae with some exceptional records associated with Vespertilionidae (Fain, 1974; Sasa and Wada, 1966). According to Imaizumi (1970), Rhinolophidae in Japan consist of *Rhinolophus ferrumequinum* and *Rhinolophus cornutus*, both of which are divided into several subspecies or forms not yet fully confirmed. Through the examination of *Rhinolophus* bats from various localities, the present author believes that only the two *Neomyobia* mites infest bats of the genus in Japan.

Genus ***Neomyobia*** Radford, 1948

Body elongate. Leg I with 4 segments, with or without terminal claws. Striated clasping organ on genu I (third segment) directed backward. Tarsi II–IV each with 2 subequal claws. Some dorsal setae on idiosoma expanded and striated. Vulva with 2 primitive valves, but lacking genital hooks. Penis straight or sinuate (Dusbábek, 1969; Jameson, 1955; Radford, 1952). Legs I symmetrical in immature stages.

Neomyobia aberrans sp. nov.

[Japanese name: Kikugashira-kemochi-dani]

(Figs. 1–3)

Male (Fig. 1). Measurements for specimens from 3 localities are presented in Table 1.

Dorsum (Fig. 1A). Setae *ve* strongly expanded and striated basally. Setae *sc e* long, expanded and striated basally. Setae *vi* and *sc i* minute. Setae l_1 long, expanded and striated basally. Setae d_1 originating from level of penis slide, swollen and striated. Setae d_2 same in nature as d_1 but much longer than the latter, situated distinctly anterior to setae l_1. Setae d_4 weakly swollen and striated, gradually tapering. Setae d_5 smaller than d_4, ending bluntly. Penis slide at level slightly posterior to setae *sc i*. Two pairs of minute setae preceding penis slide; anterior pair situated slightly anteriad from level of seate *sc i*, and posterior pair very slightly exterior to anterior setae. A pair of minute setae present postero-laterad from penis slide. Two pairs of setae present at base of penis slide. Penis sinuate, originating from midway between setae d_2 and d_4.

Venter (Fig. 1B). Setation and setal nature as in Fig. 1B.

Legs. (Fig. 1A and B). Terminal segment of leg I with 2 minute claws. Trochanter I (=first segment) striated ventrally. Claws on tarsus II short and strong, but those on tarsi III and IV slender; paired claws subequal or anterior claw slightly stronger than posterior one. Setation and setal nature as in Fig. 1A and B.

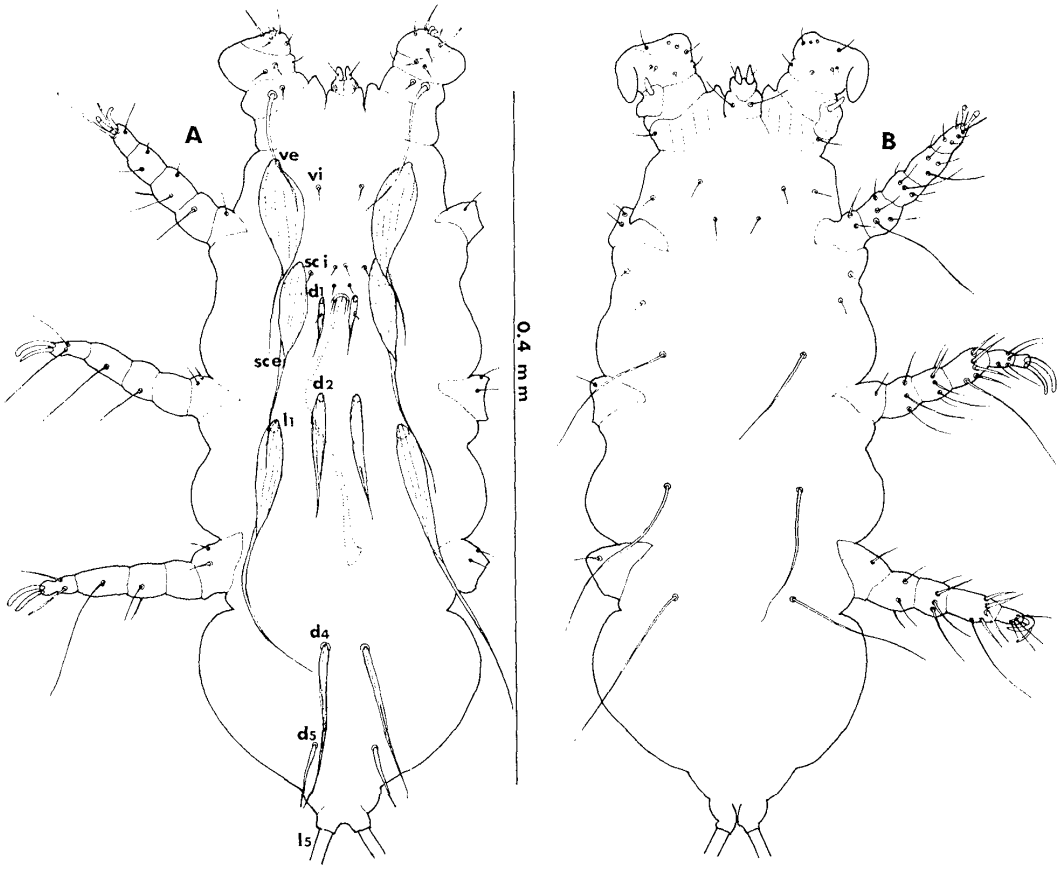

Fig. 1. *Neomyobia aberrans* sp. nov., male; A, dorsum; B, venter.

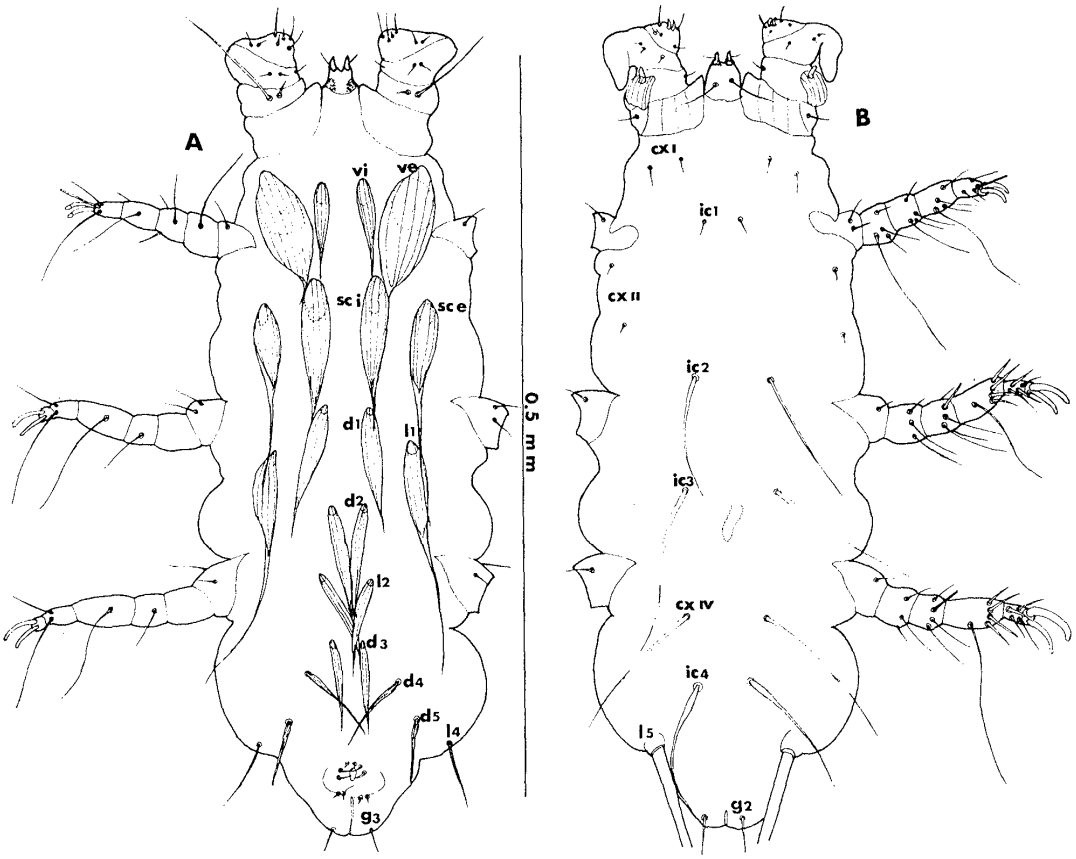

Fig. 2. *Neomyobia aberrans* sp. nov., female; A, dorsum; B, venter.

Female (Fig. 2). Measurements as in Table 2.

Dorsum (Fig. 2A). Setae *ve* strongly expanded and striated, abruptly tapering. Setae *vi* swollen, striated and gradually tapering. Setae *sc e* expanded and striated basally and, ending in hyaline, long tails. Setae *sc i* same as *vi* in nature, but much stronger than them. Setae l_1 same as *sc e* in nature. Setae l_4 simple. Setae d_1, d_2, d_3 and l_2 same as *vi* and *sc i* in nature, becoming weaker successively. Setae d_4 swollen basally and gradually tapering. Setae d_5 swollen basally and ending in blunt tips.

Venter (Fig. 2B). Setation and setal nature as in Fig. 2B. Two pairs of long setae, *cx* IV and ic_4, present on coxal region IV; ic_4 thicker and shorter than *cx*. IV. Genital setae g_1 absent. A distinct, suck-like structure embedded on median line at level posterior to ic_3.

Legs. As illustrated in Fig. 2A and B. Essentially as in male.

Tritonymph (Fig. 3 TN). Measurements are based on 11 specimens. Female tritonymph is much larger than male tritomynph, but structures, setation and setal nature are essentially the same on both tritonymphs.

Body (idiosoma+gnathosoma) 415–600 μ long by 148–210 μ wide (n=11).

Setae *vi* lacking; other dorsal setae corresponding to those of female present, but not fully developed (Fig. 3 TN). Ventral setae consisting of ic_{1-4} *cx* I_1, *cx* II_{1-2} and l_5; *cx* I_1 modified into striated formation; ic_{3-4} fine and long (Fig. 3 TN). Leg setation and setal nature as illustrated in Fig. 3 TN. Claw formula on legs II–IV: 2–1–1.

Deutonymph (Figs. 3 DN). Three specimens were examined. Length and width: 440 $\mu \times 160$ μ, 395 $\mu \times 140$ μ and 330 $\mu \times 140$ μ. Dorsal setation as in tritonymph, but setae developed weakly. A pair of coxal setae, *cx* II_2, absent; intercoxal setae, ic_3 and ic_4, not fully developed. Claw formula: 2–1–1.

Protonymph (Figs. 3 PN). Only a single specimen measured 318 μ long by 118 μ wide. Dorsal setae, d_4, lacking; ic_{1-3} and modified *cx* I_1 present ventrally. Claw formula: 2–1–1.

Larva (Fig. 3L). Three specimens measured 218 $\mu \times 88$ μ, 223 $\mu \times 90$ μ and 270 $\mu \times 105$ μ. Setation on dorsum as in protonymph, but lacking l_4. Setae *sc i* prominent; opisthonotal setae short and spatulate. Only a single pair of ventral setae, ic_1, present. Setae l_5 spaced apart. Claw formula on legs II–III: 2–1.

Material examined. The holotype male, allotype female, and 2 pairs of male and female paratypes, Akashina Town, Nagano Prefecture, September 4, 1974; 2 ♀♀, the same locality and date with types; 6 ♂♂ 2 ♀♀, Shiga Village, Nagano Prefecture, June 13, 1971; 10 ♂♂ 10 ♀♀, Sago, Tsushima, Nagasaki Prefecture, December 15, 1974; 10 ♂♂ 13 ♀♀, Kumamoto Prefecture, March 30, 1972; 4 tritonymphs (TN), 2 deutonymphs (DN), 1 protonymph and 3 larvae, Shimashima-dani, Nagano Prefecture, December 5, 1976; 2 TN, Shiga Village, November 5, 1976; 3 TN and 1 DN, Shiga Village, June 13, 1971; 3 TN, Sago, Tsushima, December 15, 1974. The type-series of the specimens are deposited in the National Science Museum (Nat. Hist.), Tokyo, Japan (NSMT–Ac 9027～9032). The mite is very common and many other specimens are in the author's collection together with the above listed ones.

Host. Bats so far called *Rhinolophus ferrumequinum* subspp.

Remarks. From the measurements presented in Tables 1 and 2, the *Neomyobia* parasitic on bats so far considered to be different subspecies were regarded as conspecific. This mite, *Neomyobia aberrans* sp. nov., is unique in having four pairs of long setae ventrally on the female and two striated, prominent dorsal setae, d_1 and d_2, posterior to genital opening of the male, which start out to the level slightly posteriad from the scapular setae. Dusbábek (1969) divided *Neomyobia* mites into two morphologically different groups. The first group was characterized by the presence of four pairs of long ventral setae in the female and only a single pair of striated setae close to the male genital opening, while the second group was furnished with three pairs of long ventral setae in the female and two pairs of striated setae close to the male genital opening. *Neomyobia aberrans* sp. nov. is not in conformity with the mode of grouping by Dusbábek (1969). This and the unusual position of the male genital opening led the author to name the mite *aberrans*.

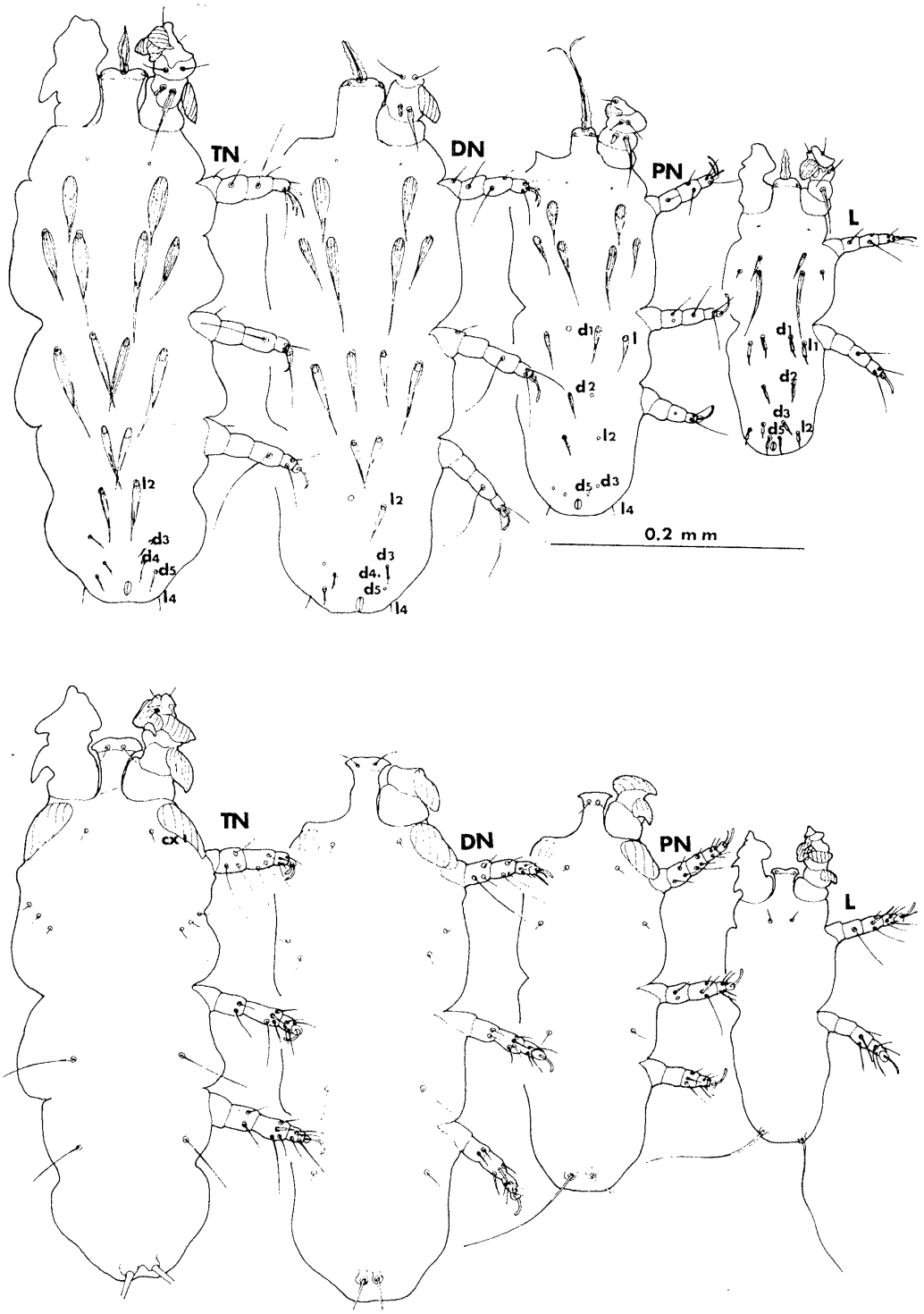

Fig. 3. *Neomyobia aberrans* sp. nov.; upper – dorsum; lower – venter. TN – male tritonymph, DN – deutonymph, PN – protonymph, L – larva.

It is also remarkable that the new species and European *Neomyobia rollinati* (Poppe, 1908) parasitic on the nominate subspecies of *R. ferrumequinum* are distinctly separable by the structure of the male genital region. This reflects the phylogenetic remoteness of the host bats of the two mites as pointed out by Uchikawa (1976).

Neomyobia plurihospitalis sp. nov.

[Japanese name: Kokikugashira-kemochi-dani]

(Figs. 4–6)

Measurements for males and females from different localities are presented in Table 2.

Male (Fig. 4). Dorsum (Fig. 4A). Setae *ve* strongly expanded and striated basally and abruptly tapering. Setae *sc e* expanded and striated basally and gradually tapering. Setae *vi* and *sc i* minute. Setae d_1 at midway between *sc e* and l_1, striated and extending anterior to or slightly beyond bases of setae d_2. Setae d_2 situated almost on level of setae l_1 striated and gradually tapering. Setae d_4 being the same as d_3, but much shorter than them. Setae d_5 minute. Setae l_1 long, swollen and striated basally, and gradually tapering. Penis slide at level slightly posterior to bases of d_1. Three pairs of minute setae present anterior to

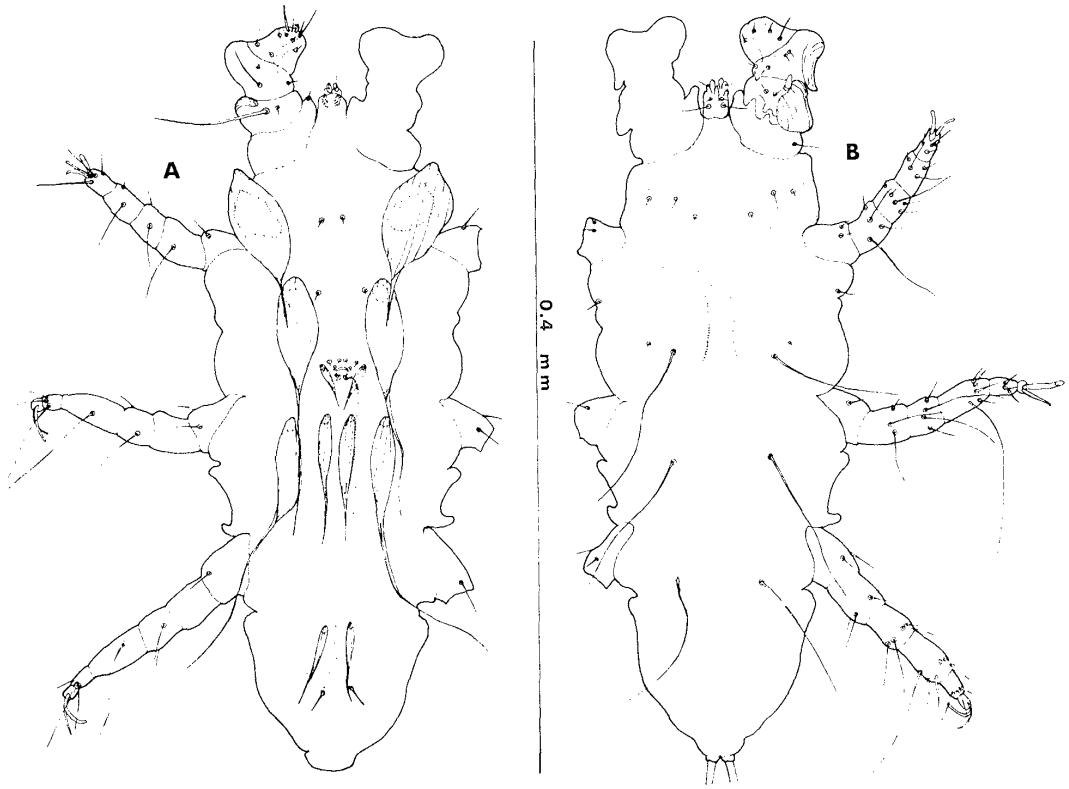

Fig. 4. *Neomyobia plurihospitalis* sp. nov., male; A, dorsum; B, venter.

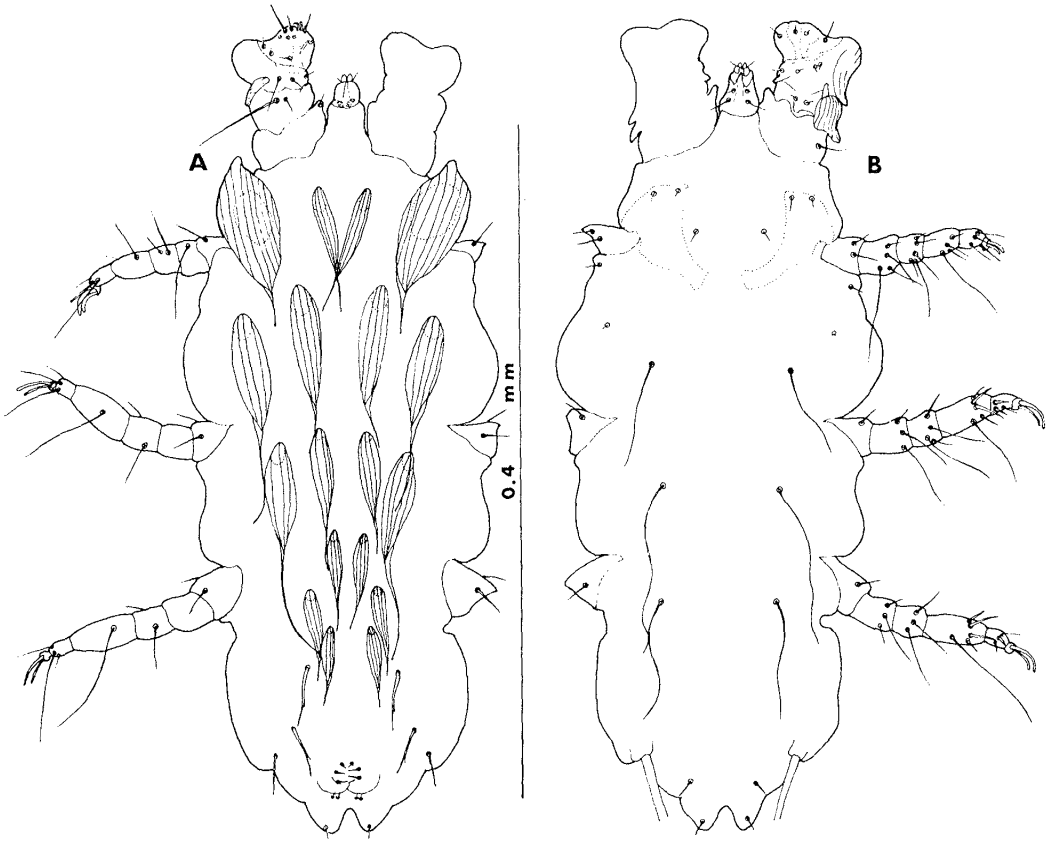

Fig. 5. *Neomyobia plurihospitalis* sp. nov., female; A, dorsum; B, venter.

penis slide; exterior- and interior-most setae arranged in a transverse row and preceding third pair. Two pairs of minute setae present posterior to penis slide. Penis originating from level posterior to d_4 and weakly sinuate.

Venter (Fig. 4B). Setation and setal nature as in Fig. 4B; *cx* II_1 very minute.

Legs. Leg I with a pair of terminal claws. Striation on trochanter I not prominent. Claws on leg II shorter than those on legs III and IV. Setation and setal nature as in Fig. 4A and B.

Female (Fig. 5). Dorsum (Fig. 5A). Setation and nature of setae as in Fig. 5A. Setae d_1 situated slightly anteriad from basal level of l_1. Length and width of opisthosomal setae with considerable variation among specimens.

Venter (Fig. 5B). Setation and setal nature essentially as in male. Genital setae g_1 and g_2 present terminally.

Legs. (Fig. 5A and B). Essentially as in male, but some ventral tarsal setae slightly thickened.

Tritonymph (Fig. 6 TN). Two specimens are available. Body 350–370 μ long by 140–155 μ wide. Setae *ve* well developed, 70–73 μ long by 23 μ wide. *Sc i* 103–110 μ long, d_1 65–70 μ, l_1 123–129 μ; distance between d_1 and d_2 50–58 μ; distance between d_2 and l_2 30–35 μ. Bases of setae d_1 and l_1 almost on a transverse

line. Ventral setae consisting of ic_{1-4}, *cx* I_1 and *cx* II_{1-2}; *cx* I_1 modified into striated formation; ic_{3-4} fine and long.

Deutonymph. Unknown.

Protonymph (Fig. 6 PN). Means followed by ranges in parentheses are based on 10 specimens.

Body 237.0 (218–250) μ long by 89.9 (82–95) μ wide. Setae *vi* developed, 47.6 (45–50) μ long by 15.7 (14–18) μ wide; *sc i* 59.9 (55–65) μ; d_1 33.4 (30–36) μ; l_1 39.0 (37–40) μ; distance between d_1 and d_2 37.6 (33–40) μ; d_2 and l_2 22.1 (18–25) μ apart. Setae d_1 and l_1 on a transverse line. Ventral setae consisting of ic_{1-3} and modified *cx* I_1. Legs as illustrated in Fig. 6 PN.

Larva (Fig. 6L). Only a single, partly damaged specimen is available. Body 258 μ long by 88 μ wide. Setae *sc i* prominent, 55 μ long.

Material examined. The holotype male, allotype female, and a male paratype ex *Rhinolophus cornutus*, Shimashima-dani, Nagano Prefecture, March 25, 1977; 2 female paratypes, April 20, 1977, a male and 2 female paratypes, a tritonymph, 14 protonymphs and a larva, June 8, 1977, and a protonymph, July 7, 1977, from the same host and locality; 3 ♀♀ ex *R. cornutus*, Otari Village, Nagano Prefecture, October 20, 1974; 3 ♀♀ ex *R. cornutus*, Tsushima, Nagasaki Prefecture, June 11–14, 1959; 2 ♂♂, 9 ♀♀ and a tritonymph ex *Rhinolophus* sp., Iriomote, Okinawa Prefecture, June 19, 1974.

The holotype male and allotype female are deposited in the collection of the National Science Museum (Nat. Hist.), Tokyo (NSMT–Ac 9033, 9034), and the other specimens of the type-series in the collection of the author.

Remarks. Although the classification of *Rhinolophus cornutus* and its relatives has not been established, it is considered that *Rhinolophus* sp. distributed in Iriomote, Okinawa Prefecture, is a valid species different from *R. cornutus* (Yoshiyuki, personal communication; Maeda, in print). *Neomyobia* from *R. cornutus* and *Rhinolophus* sp. is, however, thought to be conspecific. Variation in the length of some dorsal setae is prominent among the specimens from the same bat colony (Tables 3 and 4). And the setation around the male genital opening is quite the same on the specimens parasitic on *R. cornutus* from Nagano Prefecture and on those found on *Rhinolophus* sp. from Iriomote, Okinawa Prefecture. This indicates that only a single species, *Neomyobia plurihospitalis* sp. nov., prevails on *R. cornutus* and its relatives distributed in Japan.

Neomyobia plurihospitalis sp. nov. very closely resembles *Neomyobia slovenica* Dusbábek, 1968, a parasite of *Rhinolophus euryale*. The males of the both species are separable by the arrangement of 3 pairs of minute setae preceding the genital opening. A pair of setae succeed 2 pairs of setae in *N. plurihospitalis* sp. nov., while a pair of setae precede 2 pairs of setae in *N. slovenica* Dusbábek. Setae d_2 are situated almost on the level of the bases of the setae l_1 in *N. plurihospitalis* sp. nov., while d_2 precede the bases of l_1 in *N. slovenica* Dusbábek. The female of *N. plurihospitalis* sp. nov. is barely separable from that of *N. slovenica* Dusbábek in

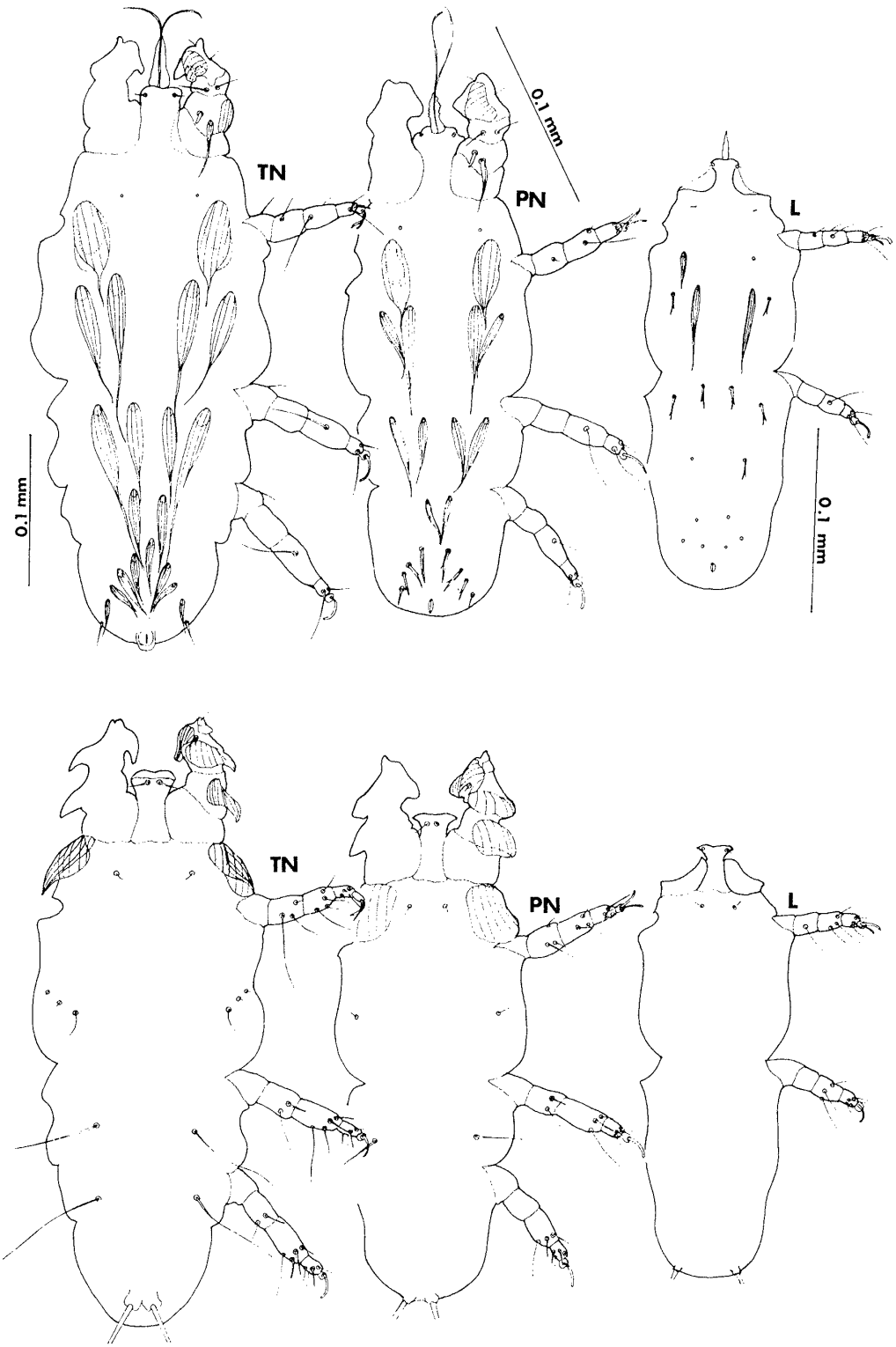

Fig. 6. *Neomyobia plurihospitalis* sp. nov.; upper – dorsum; lower – venter. TN – tritonymph, PN – protonymph, L – larva.

having setae d_1 only slightly preceding bases of l_1. The situation of setae d_1 and l_1 seems to be a differential characteristic of the two species also in immature stages.

Table 1
Measurements for males of *Neomyobia aberrans* sp. nov. from *Rhinolophus ferrumequinum* subspp. (in micron).

Host Locality	*R. f. mikado* Nagano Pref.	*R. ferrumequinum* subsp. Tsushima, Nagasaki Pref.	*R. f. nippon* Kumamoto Pref.
	n=10	n=10	n=10
Body length	455.4 (430–502)*	480.5 (460–490)	467.2 (422–500)
Body width	182.7 (162–208)	182.0 (180–190)	179.0 (165–195)
ve	83.3×27.5** (80–88) (25–30)	87.8×28.8 (83–93) (28–30)	85.5×28.6 (80–90) (28–33)
sc e	149.2×17.3 (130–155) (15–18)	152.0×17.9 (143–165) (15–20)	155.5×18.0 (145–165) (18–20)
d_1	39.5 (35–45)	44.0 (40–48)	45.3 (43–55)
d_2	82.3 (73–90)	88.8 (80–98)	82.6 (73–100)
d_4	92.0 (83–108)	97.8 (90–113)	92.5 (83–103)
d_5	37.6 (33–45)	41.2 (35–50)	41.7 (35–48)
l_1	175.3×13.8 (155–198) (13–18)	184.3×15.8 (173–193) (15–18)	180.0×16.0 (153–200) (15–20)

* Mean followed by range in parenthesis.
** Length×width.

Table 2
Measurements for females of *Neomyobia aberrans* sp. nov. from *Rhinolophus ferrumequinum* subspp. (in micron).

Host Locality	*R. f. mikado* Nagano Pref.	*R. ferrumequinum* subsp. Tsushima, Nagasaki Pref.	*R. f. nippon* Kumamoto Pref.
	n=7	n=10	n=13
Body length	531.7 (510–560)*	570.2 (540–602)	569.8 (530–590)
Body width	215.0 (200–230)	214.9 (182–232)	225.9 (212–240)
vi	70.0×12.9** (68–75) (11–15)	81.8×13.4 (73–88) (13–15)	78.4×14.1 (68–85) (13–15)
ve	104.6×36.4 (98–113) (35–38)	114.4×36.0 (105–120) (35–38)	109.9×35.3 (103–118) (33–38)
sc i	100.7×19.8 (95–105) (18–20)	111.3×20.8 (103–120) (20–25)	106.0×20.0 (95–113) (18–23)
sc e	145.8×20.4 (140–155) (18–23)	162.3×22.0 (143–183) (20–23)	165.3×21.9 (155–175) (20–25)
d_1	90.9 (83–105)	106.5 (90–115)	94.9 (80–105)
d_2	77.9 (70–85)	93.3 (85–103)	81.3 (68–88)
d_3	70.3 (60–78)	77.4 (73–85)	74.9 (63–85)
d_4	50.7 (48–58)	52.3 (46–55)	52.2 (45–60)
d_5	43.1 (35–53)	46.7 (39–55)	43.0 (38–50)
l_1	176.8 (163–188)	194.3 (180–210)	191.5 (175–205)
l_2	76.4 (70–80)	89.0 (78–98)	76.4 (70–80)

* Mean followed by range in parenthesis.
** Length×width.

Table 3
Measurements for males of *Neomyobia plurihospitalis* sp. nov. from *Rhinolophus cornutus* and *Rhinolophus* sp. (in micron).

Host Locality	*R. cornutus* Nagano Pref.	*Rhinolophus* sp. Iriomote, Okinawa Pref.
	n=3	n=2
length	385, 400, 410	400, 420
Body		
width	145, 153, 155	145, 155
ve	(83, 85, 100)×(33, 35, 38)*	(95, 95)×(38, 39)
sc e	(118, 131, 135)×(20, 23, 23)	(136, 138)×(22, 23)
d_1	28, 28, 28	28, 30
d_2	80, 83, 88	84, 88
d_4	45, 55, 58	58, 61
d_5	15, 15, 15	15, 15
l_1	(138, 150, 158)×(15, 16, 17)	(145, 155)×(15, 17)

* Length×width.

Table 4
Measurements for females of *Neomyobia plurihospitalis* sp. nov. from *Rhinolophus cornutus* and *Rhinolophus* sp. (in micron).

Host Locality	*R. cornutus* Nagano Pref.	*R. cornutus* Tsushima, Nagasaki Pref.	*Rhinolophus* sp. Iriomote, Okinawa Pref.
	n=8	n=3	n=9
length	446.5 (395–552)*	460, 465, 532	436.0 (420–442)
Body			
width	188.8 (170–200)	185, 205, 228	172.7 (165–180)
vi	72.6×13.6** (68–81) (13–15)	(66, 73, 73)×(13, 15, 15)	67.9×13.3 (63–73) (13–15)
ve	106.0×42.4 (98–113) (38–45)	(110, 110, 110)×(43, 45, 48)	99.3×35.0 (98–103) (35–35)
sc i	90.1×20.1 (85–95) (18–23)	(85, 85, 95)×(18, 20, 20)	86.5×19.6 (80–93) (18–20)
sc e	122.0×24.5 (115–128) (20–30)	(125, 126, 128)×(22, 23, 25)	126.1×24.6 (120–138) (23–25)
d_1	71.5 (62–85)	73, 75, 77	64.7 (60–70)
d_2	59.5 (53–85)	53, 60, 63	56.1 (55–63)
d_3	50.4 (45–65)	40, 43, 45	46.5 (40–53)
d_4	40.9 (38–48)	34, 38, 38	38.3 (33–43)
d_5	27.5 (25–30)	23, 25, 26	25.9 (24–28)
l_1	130.0 (120–140)	140, 143, 145	135.1 (130–143)
l_2	55.3 (47–78)	48, 48, 50	51.4 (48–58)

* Mean followed by range in parenthesis.
** Length×width.

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